DETERMINANT OF OPTIMAL ADHERENCE TO ANTIRETROVIRAL DRUGS AMONG HIV POSITIVE CLIENTS IN FEDERAL CAPITAL TERRITORY OF NIGERIA

Author: Folajinmi Oluwasina[1]

Co-Authors: **Adebimpe Olalekan[2], Bodunde Onifade[3,] Daniel Ebenezer Obi[4] Mobolaji Kolawole[5]**

[1]*University of Ibadan, Nigeria;*
[2]*University of Medical Sciences, Ondo State,*
[3]*Ladoke Akintola University,*
[4]*Texila American University, South America*
[5] *Federal University of Technology, Minna Nigeria*

Abstract: Medication adherence is an important component in the care of People Living with HIV (PLHIV). The modification to combination therapies for treating Human Immunodeficiency Virus (HIV)-infected individuals has increased adherence challenges for both patients and health-care providers. Factors associated with non-adherence appears to be patient-related. This article aims to examine the pattern and determinants of optimal adherence to antiretroviral therapy among people living with HIV. A descriptive, cross sectional study using a systematic sampling technique to select 760 persons living with HIV in Federal Capital Territory (FCT) ART clinics, Nigeria. (54%) were Females while 46% were males. 87% of respondents have been on ARV regimen in the last 3 years. About 91% had good knowledge of medication adherence 8% do not understand what adherence to medication means .Most (79%) of HIV patient's adequate adherence to ART while others (13%) usually had stopped taking their medication when they feel better about their health. The commonest source of information about medication adherence to ARV was through the adherence counselor at during ART clinics (77%)**.** Sixty percent of the respondents agreed that adherence to ARV medication helps in improving standard of living Factors that hindered effective adherence to treatment included poor providers' attitude (33.3%) and forgetfulness to take their medication and pill burden (25%). Respondents who did not adhere to treatment were less likely to subsequently adhere to ARV medication (OR= 0.324, 95%CI= 0.1-0.5). Use of treatment partner or reminders was the major determinant of medication adherence (OR = 3.4, 95%CI = 1.3-8.7). Majority of the respondents are knowledgeable about medication adherence.

Keywords: Antiretroviral therapy, HIV, Adherence, Medication

Introduction

The HIV epidemic is one of the world's most serious public health and social problems (Adekeye, 2010). The global negative effects of HIV/AIDS pandemic have been felt in all areas of life, including health, education, agriculture, faith based organizations and economic institutions (Momoh and Ezugworie, 2010). Presently, Nigeria ranks the third globally in the absolute numbers of people infected with the virus despite a relative decline in prevalence rates, from 5.8% in 2001 to 3.4% in 2012 (NARHS, 2012).

Nigeria is in the midst of a potential crisis, facing the real possibility of rates escalating to levels seen in southern Africa, unless treatment and prevention activities are greatly enhanced. This imperative to address HIV/AIDS treatment in developing countries has become more urgent as the burden of AIDS mortality has shifted to the poorest and most marginalized segments of the globe.

The Joint United Nations Program on AIDS estimated that globally, since the beginning of the epidemic, more than 70 million people have been infected with the HIV virus and about 35 million people have died of HIV compared with an estimated 1.7 million [1.5 million–2.3 million] in 2001. Globally, 36.7 million [30.8–42.9 million] people were living with HIV at the end of 2016(WHO, 2016). Sub-Saharan Africa with just over 10 percent of the world's population has the greatest burden of this disease UNAIDS, 2016). It is estimated that close to two-thirds of all people living with HIV are in sub Saharan Africa with South Africa having about 19.4 million people living with HIV/AIDS-the largest in Africa (UNAIDS, 2017).

As reported by UNAIDS, 2016, Africa has been the most greatly affected with over 16 million adults infected. Approximately, more than half of the infected populations are women. Mother to Child Transmission (MTCT) is the main mode of acquisition of HIV infection in children. In spite of this, inadequate awareness, limited counseling/testing facilities and the high level of stigma associated with HIV; have resulted in only about 10% of HIV positive individuals being aware of their status, thus limiting the number accessing treatment and care (Kitara, 2012)

The drivers of the HIV epidemic in Nigeria include: low risk perception, multiple concurrent partners, informal transactional and inter-generational sex, lack of effective services for sexually transmitted infections (STIs), and poor quality and inaccessible health services. Gender inequalities, poverty and HIV/AIDS-related stigma and discrimination also contribute to the continuing spread of the infection (FMOH, 2009). The Joint United Nations Program on AIDS estimated that approximately 3.2 million adults and children in Nigeria are living with HIV and an estimated 160 children have been orphaned by AIDS (UNAIDS 2016).

The HIV prevalence in Nigeria has risen rapidly from the first case of AIDS in 1986 to 1.8% in 1991 4.5% in 1995; 5.8% in 2001, to 5.0% in 2003 and 4.4% in 2005. According to NACA report, 2011, it was reported that, HIV prevalence is highest in urban areas, the North Central Nigeria, Benue State and among the 30-34 years age group in the year, 2010. HIV prevalence among youth age 15-24 declined from 6% in 2001 to 4.3% in 2005, 4.2% in 2008 and 4.1% in 2010. HIV prevalence is at a higher risk among sex workers 24%; MSM 17% and 4% IDUs respectively (IBBSS 2010 and NACA, 2011). Although HIV prevalence is much lower in Nigeria compared to many African countries such as South Africa and Zambia but because of the large population of Nigeria the prevalence of 4.4% is a considerable burden. Thus, Nigeria

is the third largest country in the world after India and South Africa, in terms of AIDS burden. AIDS is now a leading cause of death in Nigeria (HERFON, 2007)**.**

The human immunodeficiency virus (HIV) continues to take a tremendous toll on human health, with 37 million people infected and 1.2 million deaths worldwide in 2014. In sub-Saharan Africa, where the HIV epidemic has been most devastating, more than 25 million people are HIV-infected, about 70 percent of the global total (UNAIDS,2015).

The overwhelming impact of HIV in the world especially in sub-Saharan Africa has led to an extraordinary global effort to ensure access to antiretroviral (ARV) therapy to treat the disease in every country where HIV is a threat including Nigeria. While the World Health Organization (WHO) goal of ensuring access to antiretroviral treatment (ART) for 3 million people by end of 2008 was not achieved, it continues to take a tremendous toll on human health, with 37 million people infected and 1.2 million deaths worldwide (UNAIDS, 2014). In sub-Saharan Africa, where the HIV epidemic has been most devastating, more than 25 million people are HIV-infected, about 70 percent of the global total(UNAIDS, 2015)

The mental perspective on health behaviour is based upon the assumption that our thoughts and beliefs influence our emotions and behaviour). It focuses attention on ways in which patients conceptualise health threats and appraises factors that facilitate adherence or serve as barriers to treatment (Sebate et al, 2010) However, most patients have consistently been criticised for not adequately addressing the issue of behavioural skills needed for adherence among patients, and for paying little attention to the origin of beliefs and how such beliefs influence other behaviours. Health behaviour theories provide grounds for target interventions aimed at changing behaviour or establishing good health habits (Horne et al, 2006). There are ways in which health behaviour can be modified to achieve a desired outcome is increasingly becoming the focus of research into medication adherence especially as it relates to HIV. Individual level theories explore behaviour and focus on intrapersonal factors such as knowledge, attitude, beliefs, motivation, self-concept, past experience and skills at the interpersonal level, theories of health behaviour take into consideration that an individual exists within a society and is influenced by the social environment. Thoughts, behaviours and opinions of people around an individual influence the feelings and actions of that individual, and in turn the individual has reciprocal effects on those around them.

Health behaviour theories play a crucial role in the planning and implementation of health improvement programmes. Successful health programmes are based on health behaviours, which are well understood within a social context. There are several individual-related theories related to health behaviour, which can be used to describe and guide interventions related to cognitive factors and antiretroviral therapy (ART) adherence in HIV-infected persons.

The roll-out of ARVs in many resource poor countries has been a remarkable expression of international solidarity. However, starting patients on ARVs without ensuring full adherence through an adequate support system is likely to lead to treatment failure and the emergence of drug-resistant virus which can be transmitted to others. Drug-resistance is a potentially major threat to achieving universal access as it could mean that more and more people have to switch to second-line ARVs, which are more expensive and more difficult to use thereby increasing programme costs which will reduce the total number of people with access to treatment. This

study provides information on patterns and determinants of optimal adherence to antiretroviral drugs among PLHIVs and it also identif in the era of test and treat strategy in FCT, Nigeria

Methods

Description of the study area

Abuja, the capital city of Nigeria is located in the centre of the country within the Federal Capital Territory (FCT). It is a planned city and was built mainly in the 1980s replacing the country's most populous city of Lagos as the capital on 12 December 1991. At the 2006 census, the city of Abuja had a population of 776,298 (NPC, 2016) making it one of the ten most populous cities in Nigeria. FCT occupies the fifth position in HIV prevalence cases in Nigeria, with 7.5% which is above the national average of 3.4 %.(NARHS, 2012). About 90,000 residents of the FCT or three per cent of the three million residents that underwent HIV/AIDS tests in 2016, are positive (FMOH, 2016). The facilities providing ART services includes the Secondary and private healthcare facilities across FCT. ARVs are obtained through the support of PEPFAR and all site providing ART services are all linked to the drug pool system.

Study Design

This study is a descriptive cross sectional study design.

Study population

The study population consists of People Living with HIV (PLHIV) who have been enrolled into care and commenced antiretroviral therapy within the last 2-3 years (the period that the test and treat strategy commenced, and who have been on ART for at least one year)

Inclusion criteria

People Living with HIV from the age of 15 years who have attended clinic for more than 5 times at any of the ART centers for more than two years. This will validate that the patients has had 3 or 4 mandatory adherence sessions.

Exclusion criteria

People living with HIV from the age of 15 years who are not clinically stable or are not within the enumerated area will not considered. PLHIV below 15 years of age as at this time of the study were not considered.

Results

Table 1 shows the socio-demographic characteristics of the study participants.

A total of 760 participants were selected for this study. Majority of the respondents were more of females 63.8% (n=485) than males 36.2% (n=275). Their age ranges between 1 and 68 years. Those within 20-39 age groups (66.3%) had the highest representation followed by those of 40-59 group (31.7%)

The commonly occurring age group of respondents who participated in the study were patients aged 30-39 years (50.9%) followed by aged 40-49 years (23.3%). Age group 25-29 years accounted for 11.1%, while aged above 50 years accounted for 11.1% and the least age group was 20-24 years (3.6%). Meanwhile, almost two-third (64.3%) of respondents were women compared with slightly over one-third (35.7%) men who participated in the study.

More than half (54.7%) of respondents were married and slightly over one-quarter (26.8%) were never married as at the time of the survey. Very few of respondents were divorced (1.8%) and separated to be 5.0% while more than one in ten (11.2%) were widow. The educational

status of respondents two in five (40.5%) respondents completed secondary level of education and 37.9% had up to tertiary education. Minority (1.1%) of respondents had quranic educational qualification while 5.6% did not have any formal education.

Table one further showed that majority (88.4%) of respondents were Christian while 11.1% were Muslim, while very few were traditional worshipper (0.6%). Significantly, (53.8%) A large proportion (82.4%) of respondents who participated in the study came from monogamous family and 17.6% were polygamous. Meanwhile, majority of respondents' position in the family were father and mother (30.0% & 37.2%) respectively. However, a large proportion (87.4%) of respondents have been on ARVs regimen for years compared with 12.6% who claimed they were just enrolled on the regimen about a month prior this study.

Table1: Socio-demographic factors

Variable	N (%)
Sex	
Male	275 (36.2)
Female	485 (63.8)
Age **Mean±SD**	
≤19	7 (0.9)
20-39	504 (66.3)
40-59	241 (31.7)
≥60	8 (1.1)
Religion	
Christianity	672 (88.4)
Islam	84 (11.1)
Traditional/others	4 (0.6)
Marital status	
Never married	214 (28.2)
Married	409 (53.8)
Divorced	14 (1.8)
Separated	38 (5.0)
widowed	85 (11.2)
Family type	
Monogamy	641 (84.4)
Polygamy	119 (12.0)
Position in the family	
Father	213 (28.0)
Mother	263 (34.6)
Wife	78 (10.3)
Child	122 (16.1)
Others	84 (11.1)
Occupation	

Businessman/woman	384 (50.5)
Civil servant	139 (18.3)
Artisan	94 (12.4)
Unemployed	143 (18.8)
Highest level of education completed	
None	35 (4.6)
Quranic	8 (1.1)
Primary	115 (15.1)
Secondary	306 (40.3)
Tertiary	288 (37.9)
Others	8 (1.0)

Table 2 below describes respondent's adherence to ART. A higher proportion of respondents (87%) have had years of ARV usage and the highest duration of taking antiretroviral therapy is 5 years and above 34.7% followed by 2-3 years (26.2%) and one year (16.6%) respectively. Majority, (80.1%) of the respondents are on first line antiretroviral regimen while a smaller proportion (19%) are on second line ARV regimen. Respondents agreed (46.4%) that adherence to treatment were also made possible with the help of Family friends or treatment supporter.

Table 2: Adherence to ART among PLHIV

Variable	N (%)
How long have you been on ARV (Months/Years)	
Month	99 (13.0)
years	661 (87.0)
How long have you been taking Antiretroviral therapy?	
Less than 6 months	76 (10.0)
One year	126 (16.6)
2-3 years	199 (26.2)
3-4 years	95 (12.5)
Above 5 years	264 (34.7)
What ARV regimen are you taking?	
First line regimen	612 (80.5)
Second line regimen	144 (18.9)
Third line regimen/salvage	4 (0.5)
Do you ever forget to take your drug?	

Yes no	285 (37.5) 475 (62.5)
Are you careless at times about taking your medicine? Yes No	 97 (12.8) 663 (87.2)
When was the last time you missed taking your drug? Within the past week Within the last one month 2-3 months ago More than 4 months ago Never skip medications	 149 (19.6) 75 (9.9) 79 (10.4) 69 (9.1) 388 (51.1)
When you feel better, do you sometimes stop taking your medicine? Yes No	 714 (93.9) 46 (6.1)
Satisfaction with overall support from friends and family Very dissatisfied Somewhat dissatisfied Somewhat Satisfied Very Satisfied	 48 (6.3) 64 (8.4) 120 (15.8) 528 (69.5)
Extent of help of friends and family or treatment supporter on drug adherence Not at all A little Somewhat A lot Not applicable	 93 (12.2) 42 (5.5) 90 (11.8) 429 (46.4) 106 (13.9)

Adherence to an HIV regimen gives ART the chance to do its job by preventing HIV from multiplying and destroying the immune system. ART helps people with HIV live longer, healthier lives and also reduce the risk of HIV transmission. Majority (93.9%) agreed that sometimes they stop taking their drugs when they feel better. This supports a a cognitive-behavioral theory that says patients' treatment perceptions and illness representations influence their adherence to medication.

There is no gold standard by which to measure adherence to medication. Many studies employ a number of methods, either alone or in combination to measure adherence. The most common include: electronic drug monitoring (EDM) devices, pill counts, biochemical markers, pharmacy refill records and various self-reporting tools such as questionnaires and visual analogue. The study specifically focused on self report by clients through a structured questionnaire and confirmed through patients care card records and pharmacy refills records. A patient was said to be adherent to treatment when he or she takes his or her pill 95% of the time

The table 3 below shows patterns of adherence among respondents. Good adherence were measured based on self reports and pill counting method of each clients that were sampled for the study. This shows that majority of the respondents reported good adherence with a confirmation on their patient's records at the clinic. Females were reported more adherent to treatment than the males

Table 3: Socio demographics on Adherence to medication

Variables	Adherence to drugs		p-value
	Good adherence N (%)	Poor adherence N (%)	
Sex Male Female	261 (97.0) 473 (98.3)	8 (3.0) 8 (1.7)	0.233
Religion Christianity Islam Traditional/others	646 (97.6.0) 84 (100.0) 4 (100.0)	16 (2.4) 0 (0.0) 0 (0.0)	0.537
Marital status Never married married Divorced Separated widowed	200 (94.3) 398 (99.0) 14 (100.0) 38 (100.0) 84 (100.0)	12 (5.7) 4 (1.0) 0 (0.0) 0 (0.0) 0 (0.0)	0.01
Family type Monogamy Polygamy Others	313 (99.4) 87 (97.8) 334 (96.5)	2 (0.6) 2 (2.2) 12 (3.5)	0.042
Position in the family Father Mother Child Others	201 (96.2) 333 (99.7) 119 (99.2) 76 (92.7)	8 (3.8) 1 (0.3) 1 (0.8) 6 (7.3)	0.001
Occupation			

Business	373 (98.7)	5 (1.3)	
Civil servant	127 (92.0)	11 (8.0)	
Artisans	93 (100.0)	0 (0.0)	
unemployed	141 (100.0)	0 (0.0)	0.000
Highest level of education completed			
None	35 (100.0)	0 (0.0)	
Quranic	8 (100.0)	0 (0.0)	
Primary	112 (98.2)	2 (1.8)	
Secondary	299 (99.0)	3 (0.4)	Fishers exact test
Tertiary	273 (96.1)	11(3.9)	

Without adequate adherence, antiretroviral agents are not maintained at sufficient concentrations to suppress HIV replication in infected cells and to lower the plasma viral load. In addition to being associated with poor short-term virological response, poor adherence to antiviral medication accelerates development of drug-resistant HIV. Therefore, identifying and overcoming the factors that reduce adherence to combination antiretroviral agents is of utmost importance for prolonged viral load suppression.

Poor adherence to an HIV regimen allows HIV to destroy the immune system. A damaged immune system makes it hard for the body to fight off infections and certain cancers. Poor adherence also increases the risk of drug resistance and HIV treatment failure.

Table 4: Knowledge and Attitude to Medication Adherence

Variable	N (%)
Ever heard about ARV medications adherence	
Yes	683 (89.9)
No	77 (10.1)
Source of information	
Hospital/Health worker	
Mass media(TV/Radio, Newspaper)	*373 (96.1)
Internet	12 (3.1)
	3 (0.8)
Respondents understanding of drug adherence	
Taking the drug	
Yes	672 (88.4)
No	88 (11.6)
Taking the right ARVs dose	
Yes	676 (88.9)
No	84 (11.1)
Taking the ARVs at the right frequency	
Yes	684 (90.0)

No	76 (10.0)
Taking ARVs at the right time	
Yes	693 (91.2)
No	67 (8.8)
Knowledge of benefits of adhering to ARVs	
CD4 count getting high Yes No	489 (64.3) 271 (35.7)
Viral load crashing Yes No	423 (55.7) 337 (44.3)
Co-infections is preventable is preventable Yes No	542 (71.3) 218 (28.7)
Better health is guaranteed? Yes No	665 (87.5) 95 (12.5)

Table 4 describes the knowledge and attitude of medication adherence among patients who participated in the study. Majority of respondents (89.9%) were aware about ARV medication adherence and their highest source of information is Hospital/Health worker (96.1%). More people were observed to understood key areas of drug adherence which were taking the drug (88.4%); taking the right ARVs dose (88.9%); taking the ARVs at the right frequency (90.0%) and timeliness of ARVs use (91.2%) respectively.

Patients' beliefs, knowledge and expectations regarding treatment strongly influence their medical decision making. Every ART-prescribed patient needs to understand that with appropriate treatment and continuing adherence HIV/AIDS is now a manageable chronic disease. Therefore, every patient needs to understand the importance of adherence because inaccurate information and misconceptions towards the disease and treatment regimens are associated with poor therapeutic outcomes that in turn may be an impediment to achieving optimal levels of adherence. PLHIV who believe in the efficacy of ART are more likely to adhere. Hence, care providers should continue to educate PLHIV and their families and develop intervention strategies that address the local context in order to encourage people to adhere to ART

Table 5: Factors affecting medication adherence to treatment

Variable	N (%)
What is view about ARV	
I have used ARVs without any problem	550 (72.4)
I have used ARVs in spite of problems	171 (22.5)
I never used it	39 (5.1)
Have you ever feel any barrier when you are seeking for medical service as regards ART?	
	40 (5.3)
Yes	720 (94.7)
no	
If you need medical service on ART, where do you prefer to go?	
Health Centre	729 (95.9)
Pharmacy	13 (1.7)
Patent Medicine Vendors	13 (1.7)
General practitioner	5 (0.7)
Do you know of any ART centre that is close to your house ?	
Yes	171 (22.5)
No	589 (77.5)
How close is the nearest center to you?	
Within walking distance	60 (7.9)
A taxi drop or two taxi drops	588 (77.4)
Outside your place of residence	112 (14.7)
Have you ever been denied receiving drugs from the clinic before?	
Yes	34 (4.5)
No	726 (99.6)
Have you ever been turned back /refused services at your ART clinic during working hours before for any reason?	
Yes	20 (2.6)
No	740 (97.4)
If yes to Q34, what was the reason?	
Because I came after appointment date	3 (16.7)
Because I missed appointment	9 (50.0)
I came late	3 (16.7)
They don't have drugs	3 (16.6)

Are the hours the facility open convenient for you?	
Yes	731 (96.2)
No	29 (3.8)
Have money ever hindered you from the use of ARVs?	
Yes	86 (11.3)
No	674 (88.7)
Do you buy ARVs?	
Yes	6 (0.8)
No	754 (99.2)
Does your religious belief act as a barrier to medication Adherence?	
Yes	17 (2.2)
No	743 (97.8)

Table 5 above describes factors affecting medication adherence to treatment. A consistently higher proportion of individuals reported use of ARVs without any problems (72.4%) and non-experience of barrier when seeking medical services on ARTs (94.7%).

Almost all the respondents had never been denied receiving ARVs drugs before (95.5%) and the hours of opening by the facility were hugely (96.2%) accepted as convenient.

Patients' reports of missing pills, which are almost always reliable, so self-reports can be helpful for understanding the dynamics surrounding missed medication. Pill counts have been widely used. The return of excess pills provides tangible evidence of non-adherence. However, pill counts require patients to return the medication packaging to the clinician. Even in clinical trial situations, patients tend to forget the packages or inadvertently discard them. There have also been reports that patients other than those with HIV, aware that pill counts are being conducted, engage in "pill dumping" to appear adherent. As a result, pill counts typically overestimate adherence. Third, assays of drug levels have been used in clinical trials to measure the last dose taken; however, these assays are often impractical because of their expense and lack of general availability. In addition, serum concentrations of nucleoside analogues may not reflect intracellular concentration of the active.

Considering the adherence practices of respondents, it was observed that respondents who didn't usually forget to take their regimen were more than those who usually forget to take the regime (62.8% Vs. 37.2%). But majority (86.8%) were opined that they had never been careless to take the ARV medicine compared with 13.2% who said so. More than half (51.3%) claimed that they never skipped their medications, but 19.5% said within the past week prior this survey they had missed taking their ARV regimen. A large proportion of respondents reported that they never stopped their ARVs drugs whenever they feel better about their health compared with 6.3% who claimed they had stopped taking the regimen when they felt they were feeling

okay with their health. Also, majority (95.5%) of the respondents claimed sometimes if they feel worse they never stopped taking the regimen.

it is observed that majority (97.5%) of respondents claimed adherence counselling is mandatory before commencing ARVs compared with 1.4% who didn't know about adherence counselling. Two-third (67.0%) of respondents who participated in the study claimed that whenever they missed my drugs for a day, they will take it the next day while one-quarter (25.5%) said they never take it next day they missed the regimen. Also, a large proportion (96.8%) of respondents were of the fact that 100% adherence is desired for people living with HIV and 94.0% agreed that they have been adhering to their drugs, and would like to continue in such way compared with 4.1% who were not sure of continuing in such pattern.

Majority (87.9%) of respondents however, agreed that they won't allow any obstacle to prevent them from holistically taking my ARVs, about one in ten (12.4%) of respondents still don't mind missing ARVs on some days. Close to one-fifth (17.3%) of respondents agreed that there would be no consequences if they miss ARVs on some days but disagreed by majority (73.3%). Respondents who wish to soon discontinue ARVs was 9.1% and those who were not sure accounted for 8.4%.

Respondents who want to start to combine herbal and alternative therapy with ARVs were very small compared with those who disagreed with such attitude (4.1% Vs. 90.1%). While 69.3% of respondents claimed they would not like to skip my drug collection appointment days and 98.0% said they would keep to their appointments days related to drugs taking and adherence. A large proportion (99.1%) of respondents agreed to keep to the ARVs dosing, frequency and time.

This study showed a higher proportions of individuals correctly affirm to all the good ARVs drug adherence practices particularly on practices such as: not seeing ARVs drugs as poisons (93.3%); continuation of drugs in spite of side effects (91.2%)

Logistics Regression Model of determinants of optimal Medication Adherences of Patients to Antiretroviral Therapy.

Logistic regression was used to test associations between various factors and medication adherence in the study locations. Multivariate analysis was therefore used to test the degree of associations between independent and dependent variables which were assessed using odds ratios. The overall model in table 5 shows that factors identified were good predictors of dependent variable – carelessness in taking ARVs in the study locations ($\beta = 1.866, df = 1, p < 0.05$). The model was based on dichotomous response variable – poor adherence (0) and good adherence (1) and /or categorical explanatory variable(s), which are various factors affecting medication adherence to treatments. Thus, for every patient adherence,

$\beta = 0 \implies$ P (adherence) is the same at each level of x

$\beta > 0 \implies$ P(adherence) increases as x increases

$\beta < 0 \implies$ P(adherence) decreases as x increases

Therefore, the Odd Ratio (OR) is determined in the same model explaining how more likely factors are able to influence ARVs medication adherences.

Table 6 Variables in the equation

	Beta Coefficient	Standard Error	Wald Statistics	Degree of Freedom	P-value	Odd Ratio (OR)
Constant	1.866	0.117	253.379	1	0.000*	6.464

*P<0.05

Considering the factors affecting medication adherence, the logistics regression model shows that there was significant association between proximity/ closeness of ART centres to patients' house and medication adherence. Thus, proximity of patients' house or nearest to the ART centres is 0.180 times more likely to influence medication adherence ($\beta = -1.716, Odd\ Ratio\ [OR] = 0.180, p < 0.05$). As distance to ART centres decreases, then medication adherences increases.

Also, there was a significant relationship between refusal of service at patients' ATR clinics during working hours in the past for any reason and their medication adherence. Prompt service to people living with HIV without hesitation is 28.577 times more likely to influence adherence medication ($\beta = 3.353, Odd\ Ratio\ [OR] = 28.577, p < 0.05$). This implies that, the more the prompt ART services increases the more the adherence of the medications. There was a significant association between financial constraints for patients in seeking medical services with respect to the use of ARVs and good medication adherence. Financial constraints of patients living with HIV in seeking medical services is 6.543 times more likely to influence medication adherences in the study location ($\beta = 1.878, Odd\ Ratio\ [OR] = 6.543, p < 0.05$). This means that an increase in financial resources of the patients will increase their medication adherences.

The religious belief system of people living with HIV is significant associated with their medication adherences. The decrease in the religious belief system will increase medication adherences of ART. The religion of patients is 0.167 times more likely to influence medication adherences ($\beta = -1.793, Odd\ Ratio\ [OR] = 0.167, p < 0.05$). proximity/ closeness of ART centres to patients' house, refusal of service at patients ART clinic during working hours for any reason, financial constraints for patients in seeking medical services and religious belief system of patients become strong influencing factors that influence mediation adherences to treatment of people living with HIV.

Table 7: Logistics regression model of factors influencing medication adherences

Dependent Variable: Respondents ever careless in taking ARVs in the past	Beta Coefficient	Standard Error	Wald Statistics	Degree of Freedom	P-value	Odd Ratio (OR)
Constant	-2.182	3.046	0.513	1	0.474	0.113
Existences of barriers in seeking medical services regarding ART	0.619	0.365	2.871	1	0.090	1.857
Preference locations of ART medical services	0.008	0.198	0.001	1	0.969	1.008
Proximity/ closeness of ART centres to patients house	-1.716	0.439	15.276	1	0.000*	0.180
Nearest centre to patients house	0.158	0.203	0.608	1	0.435	1.171

Denial to receiving ARVs drugs from clinic before	-0.835	0.907	0.849	1	0.357	0.434
Refusal of service at patients ATR clinic during working hours before for any reason	3.353	0.889	14.234	1	0.000*	28.577
Convenience hours the facility open for patients	0.871	1.028	0.717	1	0.397	2.389
Money constraints for patients in seeking medical services	1.878	0.320	34.418	1	0.000*	6.543
Buying ARVs in the past	0.001	1.014	0.000	1	0.999	1.001
Religious belief system of patients	-1.793	0.701	6.540	1	0.011*	0.167

*P<0.05

Table 8: Association between factors that motivate and sustain good adherence and adherence to drug status

Variable	Adherence categories		X^2	p-value
	G A	PA		
Ever forget to take your drug				
Yes	275 (97.5)	7 (2.5)		
No	456 (97.4)	12 (2.6)	0.005	0.575
Are you careless at times about your drug taking				
Yes	89 (92.7)	7 (7.3)		
No	626 (98.3)	11 (1.7)	10.79	0.005
Do you stop taking drug when feel better			Fisher's Exact	
Yes	46 (100.0)	0 (0.0)	Test	
No	685 (97.3)	19 (2.7)		0.296
Did you get any education medication adherence				
Yes	666 (97.9)	14 (2.1)		
No	64 (92.8)	5 (7.2)	6.818	0.24
Do you have treatment supporter				
Yes	298 (94.9)	16 (5.1)		
No	433 (99.3)	3 (0.7)	14.36	0.00
Ever heard about ARV medication adherence			Fisher's Exact	
Yes	659 (97.8)	15 (2.2)	Test	
No	71 (94.7)	4 (5.3)		0.199
Ever feel any barrier when seeking medical services of ART collection				
Yes	38 (95.0)	2 (5.0)		
No	693 (97.6)	17 (2.4)	1.04	0.269
Preferred location of ART services	701 (97.4)	19 (2.6)		

Health center	13 (100.0)	0 (0.0)		
Pharmacy	12 (100.0)	0 (0.0)		
Patent Medicine Vendors	5 (100.0)	0 (0.0)	39.26	0.000
General Practitioner				
How close is the nearest center to you				
Within walking distance	223 (99.1)	2 (0.9)		
A taxi drop or two	473 (96.5)	17 (3.5)	3.97	0.033
Ever being denied receiving of drugs from clinics				
Yes	23 (67.6)	11 (32.4)		
No	708 (98.9)	8 (1.1)	128.26	0.000

Variable	Adherence categories		X^2	p-value
	G A	PA		
Are the hours of opening of the facility convenient for you				
Yes	705 (97.8)	16 (2.2)		
No	26 (89.7)	3 (10.3)	7.45	0.033
Money ever hindered you from using ARV				
Yes	85 (98.8)	1 (1.2)	Fisher's Exact Test	0.339
No	646 (97.3)	18 (2.7)		
Is your religion a barrier medication adherence				
Yes	17 (100.0)	0 (0.0)	Fisher's Exact Test	0.643
No	714 (97.4)	19 (2.6)		

The table 8 above describes the association between factors that motivate and sustain good adherence and adherence to drug status. Respondents who were careless about their drug taking poorly adhere to ARVs (7.3%) compared to 1.7% of those who were not careless. (p=0.05). There is an a Association between socio-demographic factors and adherence to medication: A higher proportion of individuals who have treatment supporter (5.1%) than 0.7% of those who did not have treatment supporter poorly adhere ARVs usage. p<0.05

Conclusion.

There are a number of key issues in the study of adherence to antiretroviral therapy, including accurate measurement of adherence, assessment of the impact of adherence on viral load and clinical outcome, determination of the factors that affect adherence, and the development of interventions. Addressing these issues may provide valuable information about which patients are most at risk for non-adherence and about how adherence might be improved. Majority of

the respondents are knowledgeable about medication adherence however, Programme that enhance adherence to medication is highly recommended. Authorities should take into consideration of major barriers to medication adherence and establish barriers to a sustainable system at both national and state national level to improve adherence. An organized comprehensive education on medication adherence that is responsive to the need of People Living with HIV may become a necessity for these challenges to be overcome

Citations

Folajinmi Oluwasina et al, 2018: Determinant of optimal adherence to antiretroviral drugs among HIV positive clients in federal capital territory of Nigeria

Acknowledgements

References

Ampofo KW. (2009). Editorial commentary: Current status of HIV/AIDS treatment, care and support services in Ghana. Ghana Med J. 43(4):142–143.

Adherence Working Group of the Outcomes Committee of the Adult AIDS Clinical trials Group. (2010). AIDS Care. ; 12:255–66.

Bangsberg DR, Moss AR, Deeks SG. (2010) Paradoxes of Adherence and Drug Resistance to HIV Antiretroviral Therapy. J AntimicrobChemother. ; 53:696–9.

Bennet SJ, Lane KA, Welch J, Perkins SM, Brater CD (2006). Medication and Dietary Compliance Beliefs in Heart Failure. Western Journal of Nursing Research. 27(8): 977-993.

Brass AL, Dykxhoorn DM, Benita Y, Yan N, Engelman A, Xavier RJ, Lieberman J, Elledge SJ. (2008). Identification of host proteins required for HIV infection through a functional genomic screen.319:921–926.

Catz, S., Heckman, T.G., Kochman, A.R., &DiMarco, M. (2011). Rates and predictors of adherence to HIV medications among late middle-aged and older adults living with HIV/AIDS. *Psychology, Health, and Medicine, 6*, 47-58.

Cervone D. (2004). Thinking about self-efficacy. Behavior Modification. 24(1): 30-56.

DanelC.(2016). Early ART and IPT in HV-infected African adults with high CD4 count (Temprano trial).2016 Conference on Retroviruses and Opportunistic Infections (CROI), Seattle, USA,

Chesney MA, Ickovics JR, Chambers DB, Gifford AL, Neidig J, Zwickl B. (2014) Self-Reported Adherence to Antiretroviral Medications Among Participants in HIV Clinical Trials; the AACTG Adherence Instruments. Patients care Committee and Adherence

Fonner VA, Denison J, Kennedy CE, O'Reilly K, Sweat M. (2012) Voluntary counseling and testing (VCT) for changing HIV-related risk behavior in developing countries. The Cochrane Library.

Fonner VA, Denison J, Kennedy CE, O'Reilly K, Sweat M.(2012). Voluntary counseling and testing (VCT) for changing HIV-related risk behavior in developing countries. The Cochrane Library;

Global Burden of Disease Pediatrics Collaboration. Global and national burden of diseases and injuries among children and adolescents between 1990 and 2013. (2016) Findings from the global burden of disease 2013 study. JAMA Pediatrics. 170(3):267–87.

Horne R. Compliance, adherence, and concordance: Implications for asthma treatment. CHEST. 2006;130:65S–72S. https://doi.org/10.1378/chest.130.1_suppl.65S [PubMed

Igwegbe O, Ugboaja J.O, Nwajiaku L.A (2010) "Prevalence and determinants of non-adherence to antiretroviral therapy among HIV- positive pregnant women in Nnewi, Nigeria," International Journal of Medicine and Medical Sciences, vol. 2, no. 8, pp. 238–245, 2010. View at Google Scholar.

Kouanda S, Bocoum FY, Doulougou B, Bila B, Yaméogo M, Sanou MJ, Sawadogo M, Sondo B, Msellati P, Desclaux A.(2010). User fees and access to ARV treatment for persons living with HIV/AIDS: implementation and challenges in Burkina Faso, a limited-resource country. AIDS Care. 22(9):1146–1152. doi:

Mutevedzi PC, Newell M. (2014) the changing face of the HIV epidemic in sub-Saharan Africa. Trop Med Int Health. 19(9):1015–1028. doi: 10.1111/tmi.12344.

Nachega, J.B A. R. Knowlton, A. Deluca l (2006). "Treatment supporter to improve adherence to antiretroviral therapy in HIV-infected South African adults: a qualitative study," Journal of Acquired Immune Deficiency Syndromes, vol. 43, supplement 1, pp. S127–S133.

Palella FJ, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, (2014). Declining Morbidity and Mortality among Patients with Advanced HIV Infection - HIV Out-Patients Study Investigations. N Engl J Med. 338:853–60.

 Paterson DL, Swindell S, Mohr J, Brester M, Vergis E, Squire S.(2009) Adherence to Protease Inhibitor Therapy and Outcomes in Patients with HIV Infection. Ann Intern Med. 133:21–30.

 Sabate E. Adherence to long-term therapy: Evidence for action. Geneva: World Health Organization; 2010.

Takarinda KC, Madyira LK, (2016). Factors associated with ever being HIV-tested in Zimbabwe: An extended analysis of the Zimbabwe Demographic and Health Survey (2010–2011). PLoS ONE. 2016; 11(1):1–18. doi: 10.1371/journal.pone.0147828 .

WHO. Guidelines on HIV self-testing and partner notification: supplement to consolidated guidelines on HIV testing services.(2016). Geneva, Switzerland: World Health Organization.

W. L. Holzemer, I. B. Corless, K. M. Nokes et al.(2009). "Predictors of self-reported adherence in persons living with HIV disease," AIDS Patient Care and STDs, vol. 13, no. 3, pp. 185–197,

  Whitley HP, Fermo JD, Ragucci K, Chumney EC. (2009). Assessment of patient knowledge of diabetic goals, self-reported medication adherence, and goal attainment. Pharmacy Practice. 4(4): 183-190.

WHO.(2015). Global health sector response to HIV: Focus on innovations in Africa: Progress report. Geneva, Switzerland: World Health Organization.

UNAIDS.(2015) Access to antiretroviral therapy in Africa: status report on progress towards the 2015 targets. Geneva, Switzerland: UNAIDS; 2015

UNAIDS.(2014) 90-90-90 An ambitious treatment target to help end the AIDS epidemic. Geneva, Switzerland: UNAIDS..

 UNAIDS. (2015). Access to antiretroviral therapy in Africa: status report on progress towards the 2015 targets. Geneva, Switzerland: UNAIDS; 2015.

WHO.(2015.) Antiretroviral therapy;http://www.who.int/topics/antiretroviral_therapy/en/

WHO. (2013).Number of people receiving antiviral therapy (ART) and percentage of all people living with HIV receiving ART in low- and middle-income countries overall and by WHO region, 2013.